

Remarks

Claims 2-10, 12-14, 19-23, 25, 26, 28 and 29 are pending in the application.

Claims 4, 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chraplyvy et al. (US 2003/0007216, hereinafter Chraplyvy) in view of Hodzic et al. (Hodzic et al: "Improvement of System Performance in N x 40-Gb/s WDM Transmission Using Alternate Polarizations," IEEE Photonics Technology Letters, Vol. 15, No. 1, Jan 2003, pages 153-155, hereinafter Hodzic) and Snawerdt (US 2002/0093713, hereinafter Snawerdt).

Claims 2-3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chraplyvy and Hodzic and Snawerdt as applied to claim 10 above, and in further view of Heismann et al. (Heismann et al: "High-Speed Polarization Scrambler with Adjustable Phase Chirp," IEEE Journal of Selected topic in Quantum Electronics, Vol. 2, No. 2, June 1996, page 311-318, hereinafter Heismann).

Claims 12-14, 19-23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chraplyvy in view of Hodzic, Snawerdt and Heismann.

Claims 9, 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chraplyvy in view of Hodzic and Heismann.

Each of the various rejections and objections are overcome by amendments that are made to the specification, drawing, and/or claims, as well as, or in the alternative, by various arguments that are presented.

Also, since a dependent claim inherently includes the recitations of the claim or chain of claims from which it depends, it is submitted that the scope and content of any dependent claims that have been herein rewritten in independent form is exactly the same as the scope and content of those claims prior to having been rewritten in independent form. That is, although by convention such rewritten claims are labeled herein as having been "amended," it is submitted that only the format, and not the content, of these claims has been changed. This is true whether a dependent claim has been rewritten to expressly include the limitations of those claims on which it formerly depended or whether an independent claim has been rewritten to include the limitations of claims that previously depended from it. Thus, by such rewriting no equivalent of any subject matter of the

original dependent claim is intended to be surrendered. If the Examiner is of a different view, he is respectfully requested to so indicate.

Rejections Under 35 U.S.C. 103(a)

A. Claims 4, 10 and 29

Claims 4, 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chraplyvy in view of Hodzic and Snawerdt.

With respect to independent claim 10, the Office Action fails to establish a *prima facie* case of obviousness, because Chraplyvy, Hodzic and Snawerdt, alone or in any permissible combination, fail to teach or suggest all the claim elements. In particular, the references alone or in combination fail to teach or to suggest demodulating an APol-DPSK signal using an even bit delay line interferometer, as recited in Applicants' independent claim 10. Specifically, independent claim 10 recites:

10. A method for APol-DPSK transmission comprising:
 - modulating an input optical signal according to a precoded electronic data signal by differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal;
 - alternating the polarization of the encoded optical signal using a modulator such that successive optical bits have substantially orthogonal polarizations to generate an APol-DPSK signal; and
 - demodulating the APol-DPSK signal using an even bit delay line interferometer. (emphasis added)

In one embodiment, Applicants teach a method for transmitting and receiving an electronic data signal comprising demodulating an APol-DPSK signal using an even bit delay line interferometer. Applicants' Specification teaches that in one embodiment an optical-phase shift-keying data modulator is driven by a precoded electronic data signal from a precoder device to produce an optical DPSK signal such that the signal is carried as phase shift keying between two optical bits separated by an even number of bit periods (see Applicants' Specification p. 3 lines 13-16) and that the demodulation of the signal can be achieved by using, for example, an even bit delay line interferometer (see Applicants' Specification p. 5 lines 19-20).

None of the cited references teach or suggest the use of alternate polarization differential phase shift keying (APol-DPSK) as an optical data transmission format and thus *cannot* teach or suggest the feature of demodulating the APol-DPSK signal using an even bit delay line interferometer, as positively recited in independent claim 10.

For example, Chraplyvy teaches using return-to-zero (RZ) pulses with phase shift keying (PSK) or differential phase shift keying (DPSK) as a coding scheme in a high bit-rate long haul dispersion managed optical transmission medium. (See Chraplyvy, Abstract). Hodzic, on the other hand, teaches only that intensity modulated alternate polarization RZ signals with orthogonal polarization between adjacent bits shows improved transmission quality over general RZ and non-return to zero (NRZ) formats. (See Hodzic p. 153 para. 2). Moreover, and as correctly noted by the Office Action, both Chraplyvy and Hodzic are silent as to the use of a multiple bit delay line interferometer and multiple-bit delay differential data encoding.

Nevertheless, the Office Action asserts that in the combination of Chraplyvy and Hodzic, a two-bit delay interferometer *must* be used to decode the APol-DPSK signal. (See Office Action p. 10). Applicants disagree.

In order to combine the advantages of DPSK with alternate polarization, it is not the only solution to differential phase shift key between two optical bits separated by an even number of bit periods and to demodulate the APol-DPSK signal using an even bit delay line interferometer, as taught by Applicants and as claimed in independent claim 10. For example, Applicants' Specification notes that a prior art method for implementing alternate-polarization DPSK uses optical-time-division-multiplexing (OTDM) and polarization-multiplexing in the transmitter and that this approach is impractical for optical networks because it requires multiple optical transmitters for a single channel. (See Applicants' Specification p. 2 lines 5-12).

The Examiner's argument states that "[a]s the polarization modulator as taught by Hodzic is applied to the DPSK format of Chraplyvy...it is obvious to one skilled in the art that the differential encoder...needs to be set as a two-bit delay precoder and the demodulator...needs to be a two-bit delay line interferometer..." (See Office Action p. 8) (emphasis added). However, the Examiner cites to no art to support this conclusion. In fact, the Examiner proposes modifications to the combination of Chraplyvy and Hodzic

not disclosed in either reference in order to make the alleged combination work in the manner claimed by Applicants. Thus, it appears that the Examiner is resorting to Official Notice or relying upon personal knowledge to supply this feature which is not found in the teachings of either reference.

To the extent that the Examiner is relying upon Official Notice in maintaining the present rejection, Applicants note that according to MPEP 2144.03 “[i]t is never appropriate to rely solely on ‘common knowledge’ in the art without evidentiary support in the record, as the principal evidence upon which a rejection was based.” However, the rejection is based upon an allegedly obvious modification to a deficient combination of references. In addition, Applicants specifically challenge the reliance upon Official Notice and request that the Examiner issue a subsequent non-final office action citing to one or more particular references, if any, which demonstrate the features alleged to be obvious.

Notwithstanding the above, Applicants further note that the combination of Chraplyvy and Hodzic still fail to teach or to suggest the specific feature of demodulating the APol-DPSK signal using an even bit delay line interferometer, as recited in Applicants’ claim 10. The Office Action refers to Snawerdt as allegedly disclosing this feature.

However, Applicants respectfully submit that Snawerdt fails to bridge the substantial gap between Chraplyvy and Hodzic. In particular, Applicants respectfully submit that the combination of Snawerdt with Chraplyvy and Hodzic is improper because such a combination would be contrary to the intended purpose of Snawerdt. Specifically, Applicants submit that Snawerdt’s phase modulated signals may not be combined with polarization alternation, as suggested by the Examiner. This is clearly evident in Snawerdt’s Fig. 1, in which a depolarizer 14 is used in the transmitter 10, between the laser 12 and phase modulator 16. The presence of the depolarizer 14 in the transmitter is inherently incompatible with polarization alternation because it produces a depolarized output, whereas polarization alternator requires a polarized signal input. Thus, Snawerdt actually teaches away from Applicants’ invention, and even if combined, Chraplyvy and Hodzic in combination with Snawerdt would result in a transmitter that is not capable of

producing polarization alternation in the manner embodied in Applicants' independent claim 10.

Furthermore, even if combined, Chraplyvy and Hodzic in combination with Snawerdt would result in an inoperative device. Specifically, Snawerdt teaches a telecommunications system with a transmitter that includes a depolarizer 14 and a phase modulator 16, and a receiver having an interferometer 40 with a depolarizer 48 in one arm of the interferometer (See, e.g., Snawerdt, Fig. 3 and col. 6, lines 10-19).

Snawerdt's receiver, with the depolarizer 48 in one arm of the interferometer 40, would be inoperative for the purpose of demodulating the transmitted DPSK data with alternating polarizations. Specifically, the polarization of the incoming APol-DPSK signal needs to be maintained in the interferometer so that the two bits separated by an even bit delay will interfere at the output of the interferometer. Snawerdt's depolarizer, on the other hand, works against this because it substantially reduces the component of the polarization of the delayed bits that is parallel to the polarization of the non-delayed bits. Thus, even if combined, Chraplyvy and Hodzic with Snawerdt, would result in a device that is inoperative for demodulating the transmitted DPSK data with alternating polarizations, and would not result in Applicants' claimed embodiments.

Thus, for at least the above reasons, Applicants' independent claim 10 is allowable over the cited references under 35 U.S.C. 103. As such, the rejection should be withdrawn.

Since dependent claim 4 depends from independent claim 10 and includes all limitations thereof, and as the references cited against claim 10 have been overcome as described hereinabove, claim 4 is also allowable over the cited references under 35 U.S.C. 103.

Independent claim 29 recites similar relevant limitations to those recited in independent claim 10, in particular "a demodulator comprising an even bit delay line interferometer." As such, for at least the same reasons discussed above, independent claim 29 also is allowable over the cited references under 35 U.S.C. 103(a).

Therefore, Applicants respectfully request that the rejection of claims 4, 10 and 29 be withdrawn.

B. Claims 2-3 and 5-8

Claims 2-3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chraplyvy, Hodzic and Snawerdt as applied to claim 10 above, and in further view of Heismann.

This ground of rejection applies only to dependent claims and is predicated on the validity of the rejection of claim 10 under 35 U.S.C. 103 given over Chraplyvy in view of Hodzic and Snawerdt. Since each such dependent claim includes all the relevant limitations of the respective independent claim from which it ultimately depends, and since the rejection of independent claim 10 has been overcome, as described hereinabove, and there is no argument put forth by the Office Action that Heismann supplies that which is missing from Chraplyvy, Hodzic and Snawerdt to render independent claim 10 obvious, the rejection of the dependent claims likewise cannot be maintained.

As such, claims 2-3 and 5-8 are allowable under 35 U.S.C. 103(a) over the cited references. Thus, Applicants respectfully request that the rejection of dependent claims 2-3 and 5-8 be withdrawn.

C. Claims 12-14, 19-23 and 26

Claims 12-14, 19-23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chraplyvy in view of Hodzic and Snawerdt and Heismann.

With respect to independent claim 12, the Office Action fails to establish a *prima facie* case of obviousness, because Chraplyvy, Hodzic, Snawerdt and Heismann, alone or in combination, fail to teach or suggest all the claim elements.

In particular the alleged combination of references do not teach or suggest modulating an optical signal according to a precoded electronic data signal by differential phase shift keying between two optical bits separated by an even number of bit periods and performing polarization alternating such that successive optical bits have substantially orthogonal polarizations to generate an APol-DPSK signal, nor do the references teach or suggest that said modulating and said polarization alternating are performed simultaneously by a Mach-Zehnder modulator including a polarization

rotation device in at least one arm, as positively recited in Applicants' independent claim 12.

Applicants first note that the alleged combination, as taught by Chraplyvy and Hodzic, fail to teach or to suggest both modulating an optical signal according to a precoded electronic data signal by differential phase shift keying between two optical bits separated by an even number of bit periods and performing polarization alternating such that successive optical bits have substantially orthogonal polarizations to generate an APol-DPSK signal and wherein said modulating and said polarization alternating are performed simultaneously by a Mach-Zehnder modulator including a polarization rotation device in at least one arm, as recited in Applicants' independent claim 12.

Notwithstanding, in rejecting claim 12, the Examiner alleges that “[a]s the polarization modulator as taught by Hodzic is applied to the DPSK format of Chraplyvy...it is obvious to one skilled in the art that the differential encoder...needs to be set as a two-bit delay precoder and the demodulator...needs to be a two-bit delay line interferometer...” (See Office Action p. 17-18) (emphasis added). However, the Examiner cites to no art to support this conclusion. In fact, the Examiner proposes modifications to the combination of Chraplyvy and Hodzic not disclosed in either reference in order to make the alleged combination work in the manner claimed by Applicants. Thus, it appears that the Examiner is resorting to Official Notice or relying upon personal knowledge to supply this feature which is not found in the teachings of either reference.

Applicants note that this is an identical rationale to that applied in the rejection of independent claim 10. In addition, Applicants note that independent claim 12 includes similar relevant limitations to those found in claim 10. For example, modulating an optical signal according to a precoded electronic data signal by differential phase shift keying between two optical bits separated by an even number of bit periods and performing polarization alternating such that successive optical bits have substantially orthogonal polarizations to generate an APol-DPSK signal. Thus, Applicants respectfully submit that rejection of claim 12 under 35 U.S.C. §103 is deficient for the exact same reasons stated above with regard to claim 10.

In particular, to the extent that the Examiner is relying upon Official Notice in maintaining the present rejection, Applicants note that according to MPEP 2144.03 “[i]t is never appropriate to rely solely on ‘common knowledge’ in the art without evidentiary support in the record, as the principal evidence upon which a rejection was based.” However, the rejection is based upon an allegedly obvious modification to a deficient combination of references. In addition, Applicants specifically challenge the Examiner reliance upon Official Notice and request that the Examiner issue a subsequent non-final office action citing to one or more particular references, if any, which demonstrate the features alleged to be obvious.

In addition to the apparent resort to Official Notice, it also appears that the Examiner refers to Snawerdt as disclosing, modulating an optical signal according to a precoded electronic data signal by differential phase shift keying between two optical bits separated by an even number of bit periods. However, as further discussed above with respect to claim 10, the combination of Snawerdt with Chraplyvy and Hodzic is improper because such a combination would be contrary to the intended purpose of Snawerdt. Again, claim 12 shares relevant limitations with claim 10. For example, modulating an optical signal according to a precoded electronic data signal by differential phase shift keying between two optical bits separated by an even number of bit periods and performing polarization alternating such that successive optical bits have substantially orthogonal polarizations to generate an APol-DPSK signal. As such, and for the same reasons stated with respect to claim 10, combining Snawerdt with Chraplyvy and Hodzic would also be improper as applied to claim 12. Specifically, Applicants submit that Snawerdt’s phase modulated signals may not be combined with polarization alternation, as suggested by the Examiner. This is clearly evident in Snawerdt’s Fig. 1, in which a depolarizer 14 is used in the transmitter 10, between the laser 12 and phase modulator 16. The presence of the depolarizer 14 in the transmitter is inherently incompatible with polarization alternation because it produces a depolarized output, whereas polarization alternator requires a polarized signal input. Thus, Snawerdt actually teaches away from Applicants’ invention, and even if combined, Chraplyvy and Hodzic in combination with Snawerdt would result in a transmitter that is not capable of producing polarization alternation in the manner embodied in Applicants’ independent claim 12.

For at least the above reasons, Applicants respectfully submit that the rejection under 35 U.S.C. §103 is improper and should be withdrawn.

Applicants further note that the alleged combination of Chraplyvy, Hodzic and Snawerdt still fails to teach or to suggest: modulating an optical signal according to a precoded electronic data signal by differential phase shift keying between two optical bits separated by an even number of bit periods and performing polarization alternating such that successive optical bits have substantially orthogonal polarizations to generate an APol-DPSK signal, wherein said modulating and said polarization alternating are performed simultaneously by a Mach-Zehnder modulator including a polarization rotation device in at least one arm, as positively recited in claim 12. The Office Action asserts that Heismann teaches this feature. Specifically, the Office Action states that Heismann “teaches a Mach-Zehnder modulator including a polarization rotation device...in at least one arm; the Mach-Zehnder modulator can provide simultaneous polarization alternation and optical data phase modulation. (See Office Action, p. 20) (emphasis added). Applicants disagree.

Notably, Heismann does not teach or suggest modulating an optical signal according to a precoded electronic data signal by differential phase shift keying between two optical bits separated by an even number of bit periods...wherein said modulating and said polarization alternating are performed simultaneously by a Mach-Zehnder modulator including a polarization rotation device in at least one arm. The fact that the Office Action asserts that Heismann can or may be modified to perform simultaneous polarization alternation and differential phase shift keying between two optical bits separated by an even number of bit periods according to a precoded electronic data signal, does not establish such a teaching in the reference. To the contrary, the phase modulating in Heismann is not for the purpose of data encoding but is a sinusoidal modulation. (See Heismann, paragraph beginning on p. 312 and ending on p. 313).

Furthermore, Applicants submit that Heismann may not properly be combined with Chraplyvy, Hodzic and/or Snawerdt because Heismann teaches a polarization scrambler, which is generally a device that is used to depolarize a launched optical information signal. (See Heismann col. 1 lines 43-47). Thus, Heismann is inherently incompatible with the embodiments of Applicants' claims (claim 12 in particular), in

which the transmitted signal should have two substantially orthogonal polarizations states (i.e., alternating polarizations). Moreover, Heismann would not be suitable for its intended purpose if modified to simultaneously DPSK encode data and alternate the polarization of every other bit because the device or method would no longer produce effective polarization scrambling. See MPEP 2143.01(V).

Thus, for all of the above reasons, the references Chraplyvy, Hodzic, Snawerdt and Heismann, alone or in any permissible combination fail to teach or suggest all elements of independent claim 12, as required to support an obviousness rejection under 35 U.S.C. 103. As such, Applicants' independent claim 12 is allowable over the cited references under 35 U.S.C. 103.

Independent claim 26 recites relevant limitations similar to those recited in independent claim 12. As such, and for at least the same reasons discussed above, independent claim 26 also is allowable over the cited references under 35 U.S.C. 103. Moreover, since all of the dependent claims that depend from the independent claims include all the limitations of the respective independent claim from which they ultimately depend, each such dependent claim is also allowable over the cited references under 35 U.S.C. 103.

Therefore, Applicants respectfully request that the rejection of claims 12-14, 19-23 and 26 be withdrawn.

D. Claims 9, 25 and 28

Claims 9, 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chraplyvy in view of Hodzic and Heismann. The rejection is traversed.

With respect to independent claim 9, the Office Action fails to establish a *prima facie* case of obviousness, because Chraplyvy, Hodzic, and Heismann, alone or in any permissible combination, fail to teach or suggest all the claim elements. In particular, the alleged combination of references fails to teach or to suggest alternating the polarization of every other bit simultaneous with the step of encoding the optical source signal to produce an APol-PSK signal, wherein said alternating is performed by the Mach-Zehnder modulator, as positively recited in Applicants' claim 9. Specifically, claim 9 recites:

9. A method of APol-PSK transmission comprising the steps of:
providing a coherently polarized optical source signal to the arms of a Mach-Zehnder modulator having a polarization rotation device in at least one arm and configured to provide simultaneous polarization alternation and optical data encoding by phase shift keying;
encoding the optical source signal by phase shift keying to generate a phase encoded signal, wherein said phase shift keying is performed by driving the Mach-Zehnder modulator with an electronic data signal; and
alternating the polarization of every other bit simultaneous with the step of encoding the optical source signal to produce an APol-PSK signal, wherein said alternating is performed by the Mach-Zehnder modulator.
(Emphasis added).

The Office Action acknowledges that the alleged combination, as taught by Chraplyvy and Hodzic, is deficient with respect to this claim feature. Therefore, the Office Action alleges that Heismann teaches “a Mach-Zehnder modulator having a polarization rotation device...in at least one arm; the Mach-Zehnder modulator can provide simultaneous polarization alternation and optical phase modulation...” (See Office Action p. 31) (emphasis added). Applicants disagree.

Notably, Heismann does not teach or suggest a Mach-Zehnder modulator having a polarization rotation device in at least one arm and configured to provide simultaneous polarization alternation and optical data encoding by phase shift keying, as recited in Applicants’ independent claim 9. The fact that the Office Action asserts that Heismann can or may be modified to perform simultaneous polarization alternation and phase shift keying, does not establish such a teaching in the reference. To the contrary, the phase modulating in Heismann is not for the purpose of data encoding but is a sinusoidal modulation. (See Heismann, paragraph beginning on p. 312 and ending on p. 313). Consequently, Heismann also fails to teach or to suggest alternating the polarization of every other bit simultaneous with the step of encoding the optical source signal to produce an APol-PSK signal, wherein said alternating is performed by the Mach-Zehnder modulator, as further recited in Applicants’ claim 9.

Furthermore, Applicants submit that Heismann may not properly be combined with Chraplyvy and Hodzic because Heismann teaches a polarization scrambler, which is generally a device that is used to depolarize a launched optical information signal. (See

Heismann col. 1 lines 43-47). Thus, Heismann is inherently incompatible with the embodiments of Applicants' claims (claim 12 in particular), in which the transmitted signal should have two substantially orthogonal polarizations states (i.e., alternating polarizations). Moreover, Heismann would not be suitable for its intended purpose if modified to simultaneously PSK encode data and alternate the polarization of every other bit because the device or method would no longer produce effective polarization scrambling. See MPEP 2143.01(V).

Thus, for all of the above reasons, Applicants' independent claim 9 is allowable over the cited references under 35 U.S.C. 103. In addition, independent claims 25 and 28 recites relevant limitations similar to those recited in independent claim 9. As such, and for at least the same reasons discussed above, independent claims 25 and 28 also are allowable over the cited references under 35 U.S.C. 103. Therefore, Applicants respectfully request that the rejection of claims 9, 25 and 28 be withdrawn.

Conclusion

It is respectfully submitted that the Office Action's rejections have been overcome and that this application is now in condition for allowance. Reconsideration and allowance are, therefore, respectfully solicited.

If, however, the Examiner still believes that there are unresolved issues, the Examiner is invited to call Eamon Wall at (732) 842-8110 so that arrangements may be made to discuss and resolve any such issues.

Respectfully submitted,

Dated: _____

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